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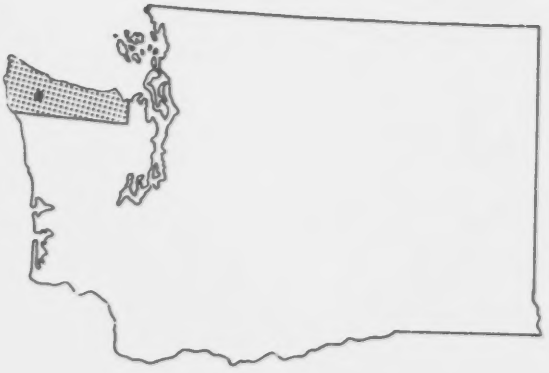
FLOOD INSURANCE STUDY

TOWN OF FORKS, WASHINGTON
CLALLAM COUNTY



REVISED: DECEMBER 16, 1988

Federal Emergency Management Agency

COMMUNITY NUMBER - 530022

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

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FLOOD INSURANCE STUDY
TOWN OF FORKS, CLALLAM COUNTY, WASHINGTON

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the Town of Forks, Clallam County, Washington, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish acturial flood insurance rates and assist the community in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program (NFIP) are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

This Flood Insurance Study revises and updates a previous Flood Insurance Study/Flood Insurance Rate Map for the Town of Forks, Washington. This information will be used by the community to update existing floodplain regulations as part of the Regular Phase of the NFIP. The information will also be used by local and regional planners to further promote sound land use and floodplain development.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the State (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgements

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were performed by the U.S. Geological Survey (USGS), Water Resources Division, for the Federal Emergency Management Agency (FEMA), under Contract Interagency Agreement No. IAA-H-8-76, Project Order No. 4. This study was completed in July 1977.

1.3 Coordination

Community base map selection and the identification of streams requiring detailed study were made in meetings attended by personnel of the USGS, FEMA, and the Town of Forks in February 1976.

A final community coordination meeting was held on July 24, 1978, attended by representatives of FEMA, the study contractor, and the Town of Forks. All changes resulting from the meeting have been incorporated into the study.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated areas of the Town of Forks, Clallam County, Washington. The area of study is shown on the Vicinity Map (Figure 1). The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development or proposed construction through 1982. Approximate analyses were used to study those areas having a low development potential or minimal flood hazards.

2.2 Community Description

Forks is located in western Clallam County, in western Washington. It is 58 miles southwest of Port Angeles on U.S. Highway 101, which bisects the town. The town was incorporated in 1945, and it had a population of 1,893 in 1975 (Reference 1). In 1985 the population was estimated to be 2,885. Forks is the westernmost incorporated town in the continental United States.

Forks is situated on a small natural level prairie surrounded by low, forest-covered hills. The main elevation of Forks is approximately 300 feet. The climate is marine, with an annual precipitation of 116 inches and an average annual temperature of 49°F (Reference 2). Very little of the precipitation falls as snow.

The flood plain areas in Forks contain mostly residential structures, with the few commercial business structures located mostly along U.S. Highway 101. The major industry of the region is logging and processing of forestry products.

Stream drainages are small, with Mill Creek at 4.10 square miles, the largest. The stream channels are narrow and shallow with flat gradients.

2.3 Principal Flood Problems

Flooding generally occurs during the winter months, November through February, when storms originating over the Pacific Ocean bring intense precipitation. The major flood problems are those of inundation and damage of private property from out-of-bank floodwaters, primarily along low-gradient reaches of the streams. Culverts and bridges were considered to be free of debris. Flood elevations increase because of limited capacities of some culverts.

The Dickey River near LaPush gage, approximately 7.5 miles west of Forks, recorded a discharge comparable to a 50-year flood discharge on January 19, 1968. This was due entirely to rainfall, as the weather stations at Quillayute (7.0 miles west of Forks) and Forks reported daily totals in inches of 7.16, 3.26, 1.21, and 4.93, 6.69, 1.77, respectively, for January 18-20 (Reference 3). The rainfall of January 18 at Quillayute represented a 25-year, 24-hour

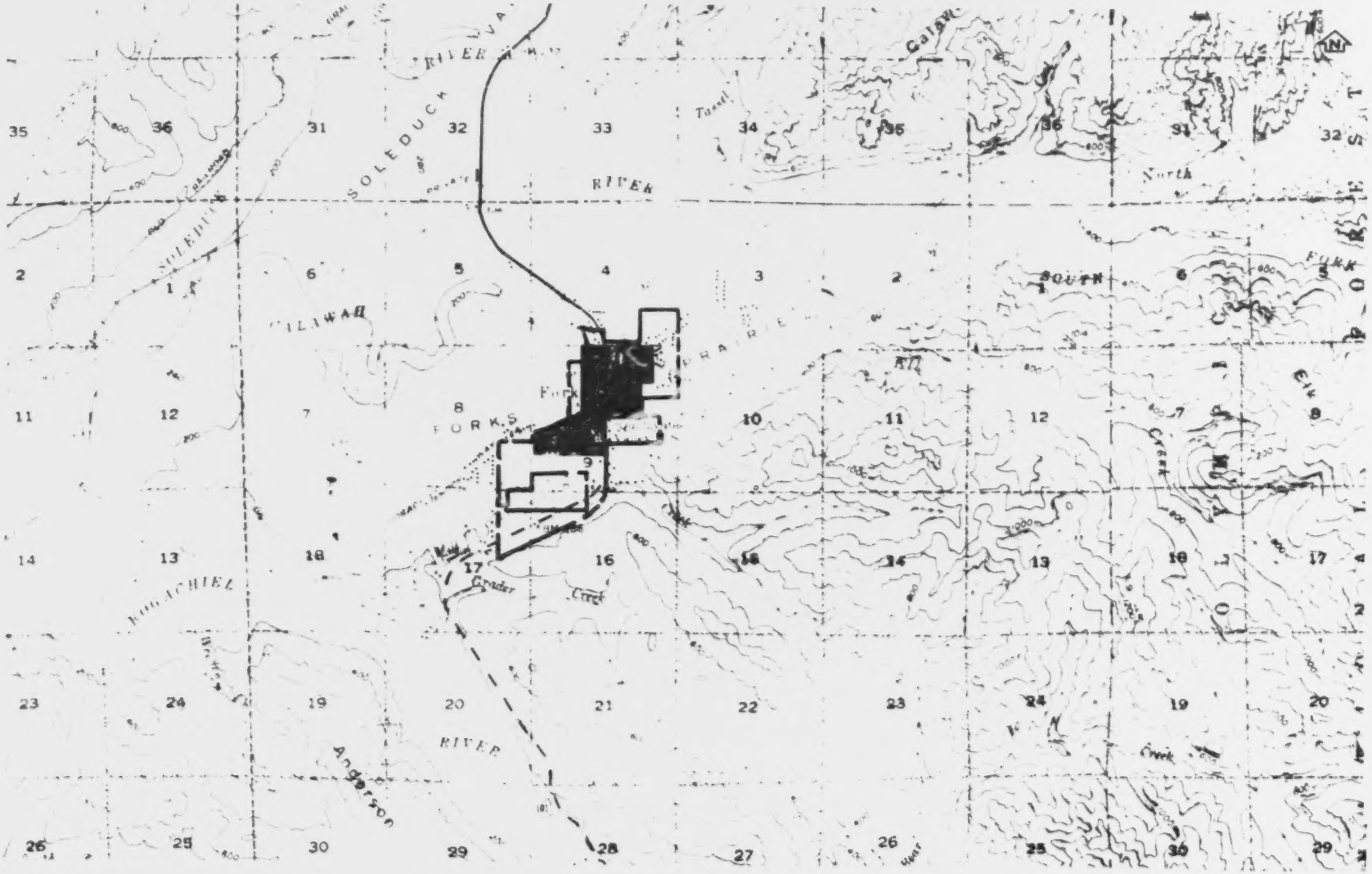


FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF FORKS, WA

(CLALLAM CO.)

APPROXIMATE SCALE

1 0 1 2 3 MILES

VICINITY MAP

precipitation; the rainfall on January 19 at Forks represented a 10-year, 24-hour total (Reference 4). The rainfall was heaviest in Forks the night of January 18 and morning of January 19; consequently, the total for a 24-hour period spanning that night and morning would have been higher than either of the daily totals at Forks.

2.4 Flood Protection Measures

Floodwaters in upper Ford Creek, upstream of Cole Creek, can be totally diverted, first by a diversion to Elk Creek (1 mile upstream of the corporate limits) and then by a diversion to the Calawah River (3500 feet upstream of the study area). These diversions are the only flood protection measures in the area and are assumed to be fully operational and implemented for the purpose of this study.

3.0 ENGINEERING METHODS

For the flooding sources studied by detailed methods in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long-term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1 percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10); and for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish peak discharge-frequency relationships for each flooding source studied by detailed methods affecting the community.

Thirteen continuous-record stream-gaging stations, with record lengths of 8 to 63 years, and 8 peak-stage partial-record stations, with 7 to 22 years of peak data, on the Olympic Peninsula (References 5-8) were used as the source of data for defining the peak discharge-frequency relationship for each stream in the

community. Values of the 10-, 50-, 100-, and 500-year peak discharges were obtained from a Log-Pearson Type III distribution of annual peak flow data at these sites in accordance with the guidelines set forth in U.S. Water Resource Council Bulletin 17 (Reference 9).

Regional relationships in existing publications (References 10 and 11) did not produce satisfactory results for the 10-, 50-, 100-, and 500-year peak discharges at the gaged sites in comparison with those obtained for the same sites by the Log-Pearson Type III distribution. Therefore, new regional relationships comparing basin characteristics (drainage area and precipitation) to streamflow characteristics (10-, 50-, 100-, and 500-year peak discharges) were developed for determining peak discharges at all sites in the Forks area.

Peak discharge-drainage area relationships for Calawah River, Mill, Ford, and Warner Creeks are shown in Table 1. Between the locations on the table, the flow is pro-rated by distance which is approximately proportional to the drainage area. The 50-, 100-, and 500-year floodflows on Warner Creek top the right bank at cross section C (1700 feet upstream of the mouth), where they leave the study area across fields to the west and do not return to Warner Creek. The flood discharges in Ford Creek decrease because of the two diversions previously mentioned.

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments where a floodway was computed (Section 4.2), selected cross section locations are also shown on the Flood Insurance Rate Map (Exhibit 2).

Cross section data for streams in the area were obtained from aerial photographs, supplemented by ground-surveyed cross sections. The underwater segments of all cross sections were obtained by ground survey. All bridges and culverts were surveyed to obtain elevation data and structural geometry.

Water-surface profiles were developed using the USGS E 431 step-backwater computer model (Reference 12). Starting water-surface elevations for Mill and Ford Creeks were obtained from culvert ratings; normal-depth calculations were used in determining the starting water-surface elevations for the Calawah River and Warner Creek. Flood profiles were drawn showing computed water-surface elevations to an accuracy of 0.5 foot for floods of the selected recurrence intervals (Exhibit 1).

Table 1. Summary of Discharges

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (Cubic Feet per Second) 10-Year	50-Year	100-Year	500-Year
Mill Creek					
At 10th Ave. S.W.	4.10	660	940	1070	1420
Above Confluence with Warner Creek	2.74	580	840	970	1290
At U.S. Highway 101	2.30	490	730	830	1110
Ford Creek					
At East Division St.	0.89	77	120	138	178
Warner Creek					
At Mouth	0.31	77	99	100	126
At Cross Section D	0.19	68	85	85	85
At Cross Section E	0.19	49	76	87	120
At Cross Section N	0.16	42	65	75	103
At U.S. Highway 101	0.11	30	47	54	75
Calawah River					
At Mouth	133.00	20,600	28,000	31,600	40,500
At U.S. Highway 101	129.00	20,000	27,300	30,800	39,400

No high-water marks from previous floods were available for comparison with the computed flood profiles, but rainfall data, newspaper articles, and pictures were available from the January 1968 flood. These were used as a check on stream flooding of approximately a 50-year discharge.

Roughness coefficients (Manning's "n") for each stream were estimated by field inspection at each cross section. Main channel roughness values ranged from 0.035 to 0.048; roughness values for the flood plains ranged from 0.040 to 0.060 for all floods.

Information concerning the areas studied by approximate methods was taken from the Federal Insurance Administration's Flood Hazard Boundary Map (Reference 13).

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

All elevations are referenced to the National Geodetic Vertical Datum (NGVD) of 1929. Elevation reference marks used in this study are shown on the maps; the description of the marks are presented in Elevation Reference Marks (Exhibit 3).

4.0 FLOODPLAIN MANAGEMENT APPLICATION

The NFIP encourages state and local governments to adopt sound floodplain management programs. Therefore, each Flood Insurance Study provides 100-year flood elevations and delineations of the 100- and 500-year floodplain boundaries and 100-year floodway to assist communities in developing floodplain management measures.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1 percent annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2 percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the 100-year floodplain boundaries have been delineated using the flood elevations determined at each cross section. For Ford, Mill, and Warner Creeks, the boundaries between cross sections were interpolated using topographic maps at a scale of 1:4800, with a contour interval of 2 feet (Reference 14). The boundaries between cross sections on the Calawah River were interpolated using topographic maps at a scale of 1:9600, with a contour interval of 1 to 6 feet (Reference 15). These topographic maps were developed from the aerial photographs that were taken in April 1976 (Reference 16).

The 100- and 500-year floodplain boundaries are shown on the Flood Insurance Rate Map (Exhibit 2). On this map, the 100-year floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A and AE); and the 500-year floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 100- and 500-year floodplain boundaries are close together, only the 100-year floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

For the streams studied by approximate methods, only the 100-year floodplain boundary is shown on the Flood Insurance Rate Map (Exhibit 2.)

Approximate 100-year floodplain boundaries in some portions of the study area were taken directly from the Flood Hazard Boundary Map (Reference 13).

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. Floodplain managers must balance the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the NFIP, a floodway is used as a tool to assist local

communities in this aspect of floodplain management. Under this concept, the area of the 100-year floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this study are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated at selected cross sections (Table 2). In cases where the floodway and 100-year floodplain boundaries are either close together or collinear, only the floodway boundary has been shown.

The area between the floodway and 100-year floodplain boundaries is termed the floodway fringe. Upon review of the extent of area available for floodway fringe and the pattern of land ownership, which includes substantial public holdings, officials of the Town of Forks decided, in keeping with city policy, that the floodways for Ford, Mill, and Warner Creeks be limited to a 0.0 foot rise.

The floodway for the Calawah River was computed on the basis of equal conveyance reduction from each side of the floodplain. For the section of the Calawah River within the town of Forks, the 100-year floodplain and floodway are coincident.

Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 2.

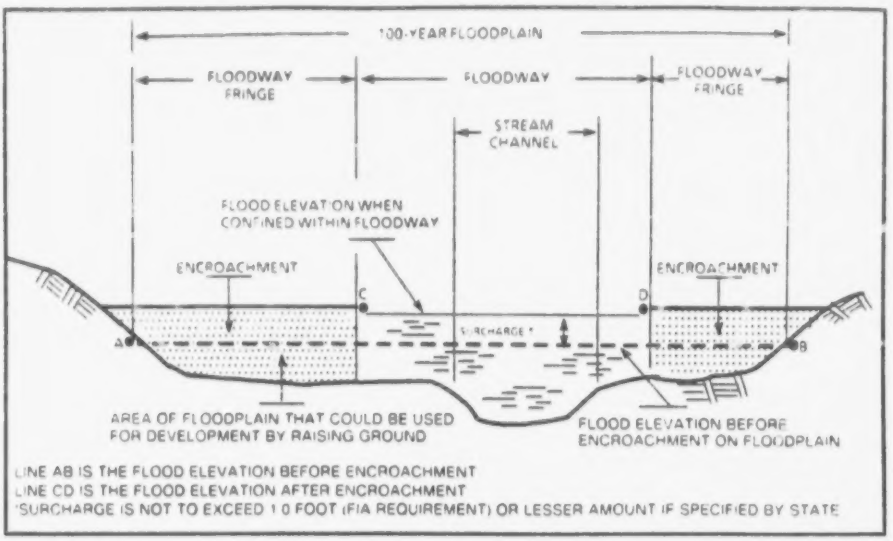

100-YEAR FLOODPLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
A
B
SURCHARGE*
AREA OF FLOODPLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOODPLAIN
LINE AB IS THE FLOOD ELEVATION BEFORE ENCROACHMENT
LINE CD IS THE FLOOD ELEVATION AFTER ENCROACHMENT
*SURCHARGE IS NOT TO EXCEED 1.0 FOOT (FIA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE

Figure 2. Floodway Schematic

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Mill Creek								
A	30[1]	141	394	2.72	272.7	272.7	272.7	0.0
B	630[1]	61	182	5.33	274.6	274.6	274.6	0.0
C	1350[1]	91	244	3.98	278.3	278.3	278.3	0.0
D	3910[1]	56	163	5.94	291.5	291.5	291.5	0.0
E	4440[1]	31	104	7.97	295.9	295.9	295.9	0.0
F	4500[1]	70	201	4.13	297.3	297.3	297.3	0.0
G	5080[1]	33	88	9.44	301.5	301.5	301.5	0.0
H	5610[1]	143/15[2]	223	3.72	307.6	307.6	307.6	0.0
I	6440[1]	45	153	5.41	311.4	311.4	311.4	0.0
Ford Creek								
A	20[3]	109	80	1.72	314.0	314.0	314.0	0.0

[1]Feet Above Mill Creek Road
[2]Width/Width Within Corporate Limits
[3]Feet Above East Division Street

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY
TOWN OF FORKS, WASHINGTON
(CLALLAM COUNTY)

FLOODWAY DATA

MILL CREEK-FORD CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Warner Creek								
A	772	14[2]	28	3.56	272.7	272.7	272.7	0.0
B	1260	42[3]	34	2.78	274.5	274.5	274.5	0.0
C	1700	124[3]	112	0.76	275.0	275.0	275.0	0.0
D	2240	80	34	2.55	275.6	275.6	275.6	0.0
E	2550	125	47	1.84	277.1	277.1	277.1	0.0
F	2920	14	16	5.61	279.8	279.8	279.8	0.0
G	3450	72	58	1.49	282.4	282.4	282.4	0.0
H	3750	57	34	2.57	283.2	283.2	283.2	0.0
I	3810	67	50	1.72	283.9	283.9	283.9	0.0
J	4020	16	23	3.75	284.4	284.4	284.4	0.0
K	4190	15	18	4.10	285.4	285.4	285.4	0.0
L	4260	112	44	1.72	286.4	286.4	286.4	0.0
M	4490	43	35	2.12	286.9	286.9	286.9	0.0
N	4870	18	25	3.04	287.8	287.8	287.8	0.0
O	4970	69	72	1.04	288.7	288.7	288.7	0.0
P	5060	62	29	2.59	288.9	288.9	288.9	0.0
Q	5160	8	12	6.49	289.6	289.6	289.6	0.0
R	5200	32	36	1.70	290.9	290.9	290.9	0.0
S	5750	11	11	5.40	294.2	294.2	294.2	0.0
T	6180	269	74	0.84	296.8	296.8	296.8	0.0
U	6550	14	15	3.57	298.0	298.0	298.0	0.0
V	6992	—[4]	—[4]	—[4]	301.1	301.1	301.1	0.0
W	7080	—[4]	—[4]	—[4]	301.2	301.2	301.2	0.0

[1]Feet Above Mouth [2]Width Lies Entirely Outside Corporate Limits [3]Width Extends Beyond Corporate Limits
[4]Data Not Available

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF FORKS, WASHINGTON
(CLALLAM COUNTY)

FLOODWAY DATA

WARNER CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Calawah River								
A	28180	265/200[2]	3264	9.68	190.3	190.3	190.3	0.0
B	28920	170	1735	18.21	191.8	191.8	191.8	0.0
C	29690	277/180[2]	3721	8.49	200.4	200.4	200.4	0.0
D	37000	156/80[2]	2579	11.94	220.9	220.9	220.9	0.0
E	37160	153/85[2]	2437	12.64	221.4	221.4	221.4	0.0

[1]Feet Above Mouth [2]Width/Width Within Corporate Limits

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF FORKS, WASHINGTON
(CLALLAM COUNTY)

FLOODWAY DATA

CALAWAH RIVER

5.0 INSURANCE APPLICATION

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. The zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 100-year floodplains determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not permitted for such areas, no base flood elevations or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year floodplains determined in the Flood Insurance Study by detailed methods. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 500-year floodplain, areas within the 500-year floodplain, areas of 100-year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

6.0 FLOOD INSURANCE RATE MAP

The Flood Insurance Rate Map is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols, the 100- and 500-year floodplains, and the locations of selected cross sections used in the hydraulic analyses and floodway computations.

7.0 OTHER STUDIES

In 1976, our Technical Evaluation Contractor, Michael Baker Jr., Inc., prepared a Flood Hazard Boundary Map of Forks (Reference 13) by the approximate method. Their study within the corporate limits of Forks

includes areas inundated by shallow flooding caused by rainfall. Results of their study are incorporated with and agree with this study.

This study is authoritative for the purposes of the NFIP Program; data presented herein either supersede or are compatible with all previous determinations.

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Natural and Technological Hazard Division, FEMA, Federal Regional Center, 130-228th Street, S.W., Bothell, Washington 98021-9796.

9.0 BIBLIOGRAPHY AND REFERENCES

1. State of Washington, Pocket Data Book, 1975.

2. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Climatological Data, Washington, Annual Summary 1976, vol. 80, no. 13.

3. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Climatological Data, Washington, Monthly Summary January 1968, vol. 72. no. 1.

4. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Environmental Science Services Administration, Precipitation Intensity Maps, 1970.

5. U.S. Department of the Interior, Geological Survey, Water-Supply Papers 1042, 1062, 1092, 1122, 1152, 1182, 1216, 1246, 1286, 1346, 1396, 1446, 1516, 1636, 1716 (1946-60).

6. U.S. Department of the Interior, Geological Survey, Surface Water Records of Washington, 1951-64, Tacoma, Washington, Annual Reports Published for Years Indicated (1962-65).

7. U.S. Department of the Interior, Geological Survey, Water Resources Data for Washington, Part 1, Surface Water Records, 1965-73, Tacoma, Washington, Annual Reports Published for Years Indicated (1966-74).

8. U.S. Department of the Interior, Geological Survey, Water-Data Report WA 75-1, Water Resources Data for Washington, Water Year 1975.

9. U.S. Water Resources Council, "Guidelines For Determining Flood Flow Frequency," Bulletin 17, 1976.

10. U.S. Department of the Interior, Geological Survey, Water Supply 1687, Magnitude and Frequency of Floods in the United States, Part 12: Pacific Slope Basins in Washington and Upper Columbia River Basin, G.L. Bodhaine and D.M. Thomas, 1964.

11. U.S. Department of the Interior, Geological Survey, Open File Report 74-336, Magnitude and Frequency of Floods in Washington, J.E. Cummans et al, 1975.

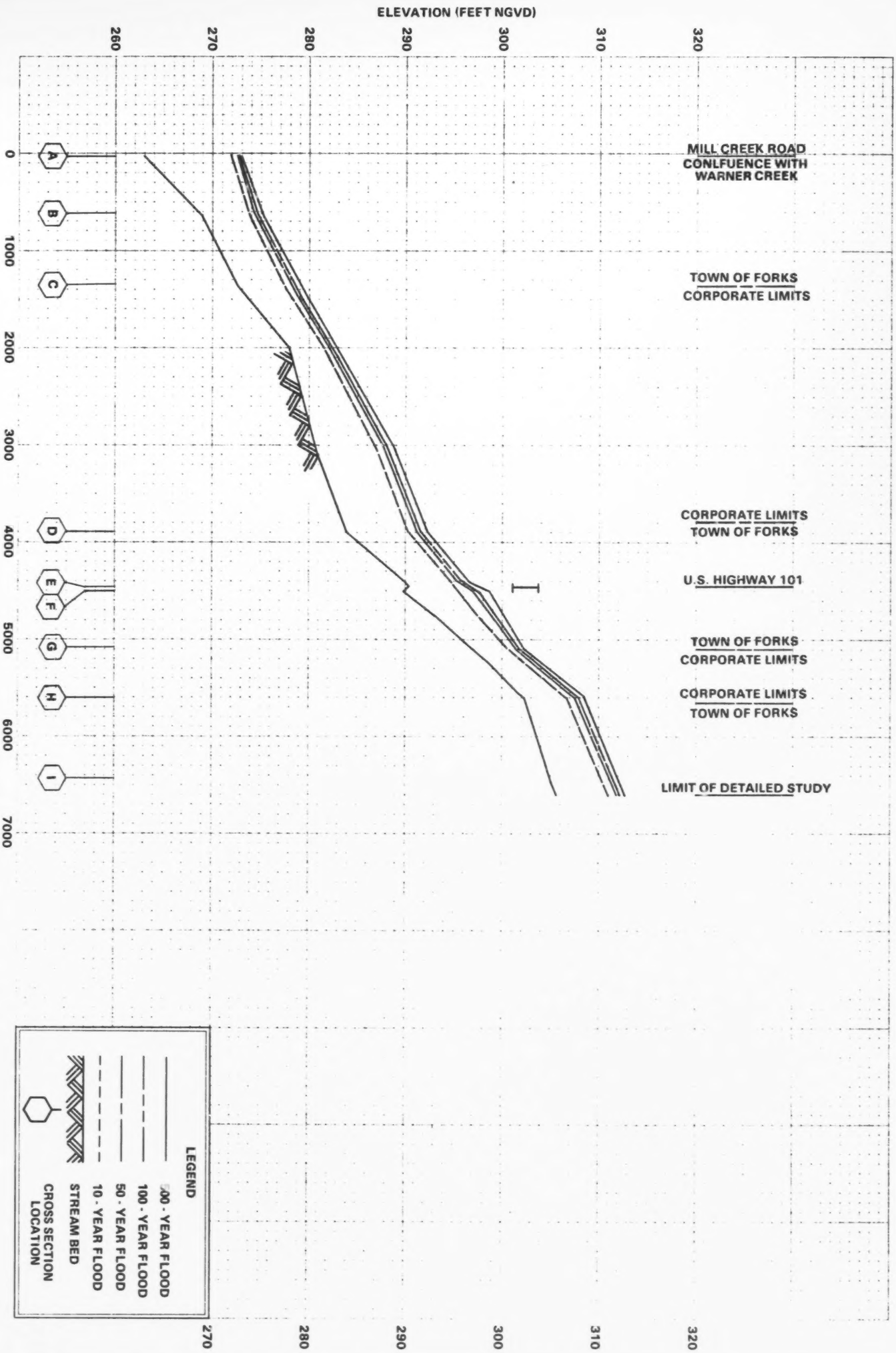
12. U.S. Department of the Interior, Geological Survey, Open File Report 76-499, Computer Applications for Step-Backwater and Flooding Analyses, 1976.

13. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Town of Forks, Washington, Scale 1:7200, 1976.

14. U.S. Department of the Interior, Geological Survey, Topographic Maps, Scale 1:4800, Contour Interval 2 feet: Forks, Washington 1976.

15. Western Aerial Survey, Inc., Topographic Maps of Clallam County, Scale 1:9600, Contour Interval 1 to 6 feet, 1977.

16. Western Aerial Survey, Inc., Aerial Photography, Scale 1:4800, Riverside, California, 1976.



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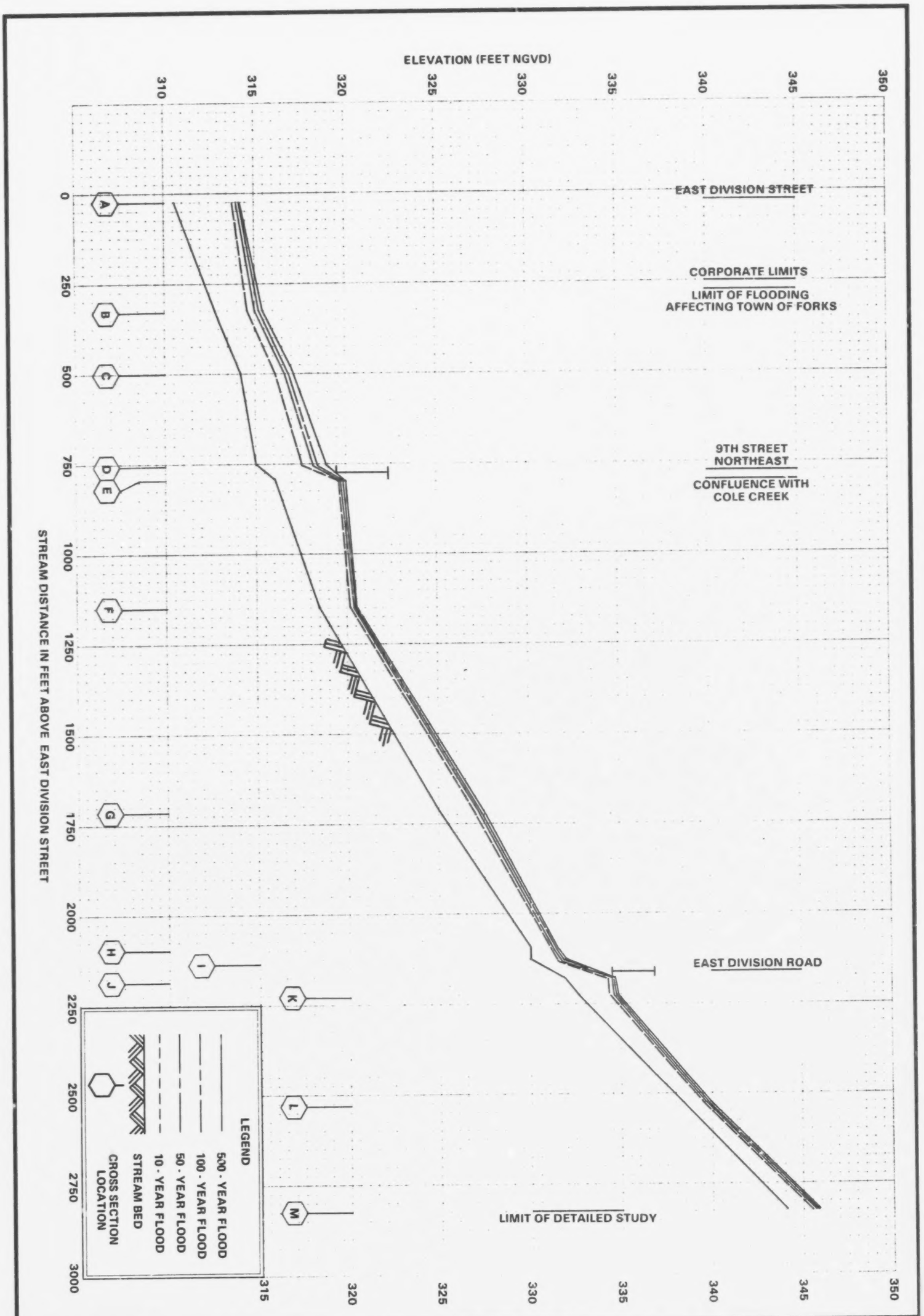
01P	FEDERAL EMERGENCY MANAGEMENT AGENCY **TOWN OF FORKS, WA** (CLALLAM CO.)	**FLOOD PROFILES** **MILL CREEK**



16

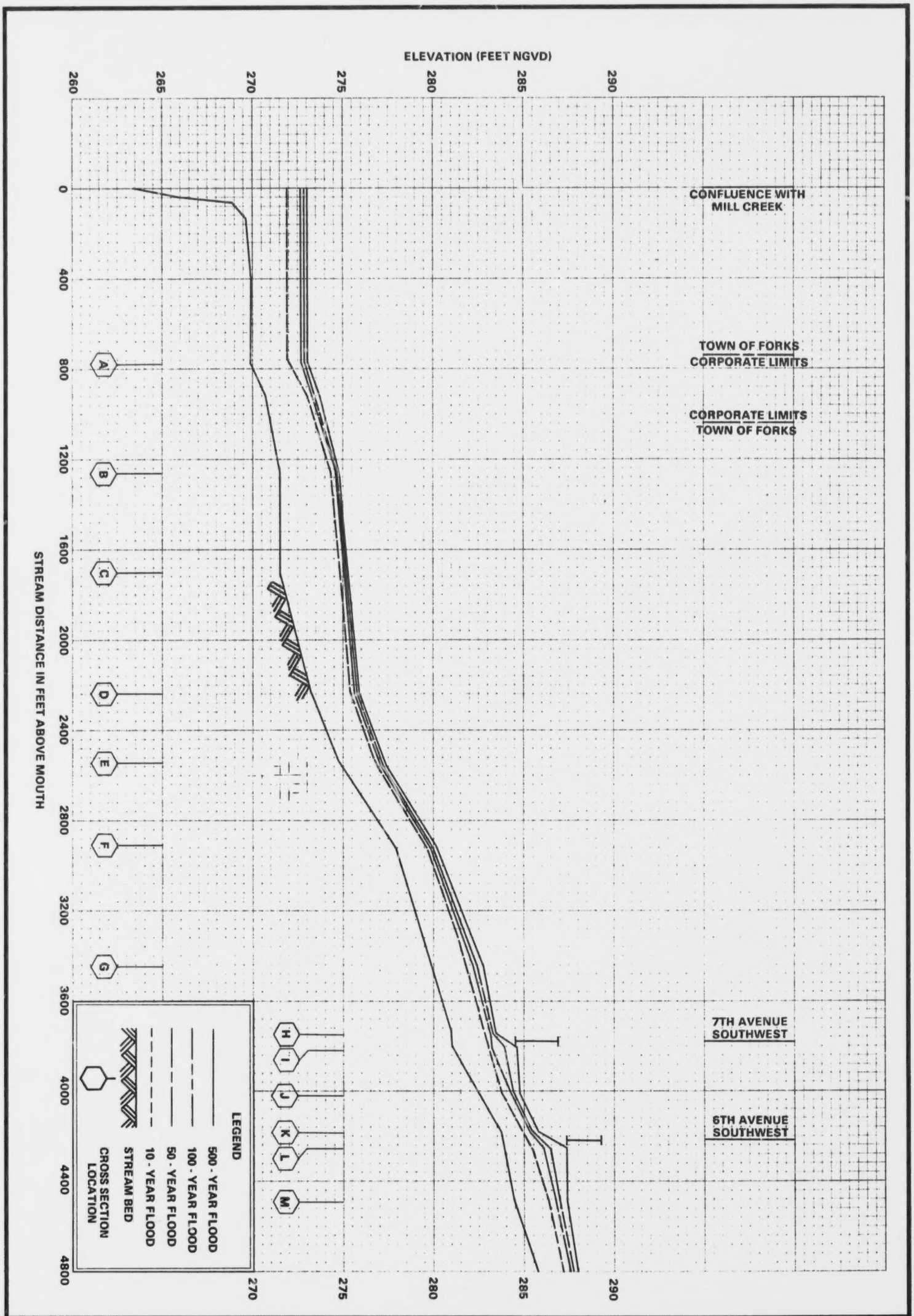
02P

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF FORKS, WA
(CLALLAM CO.)

FLOOD PROFILES

FORD CREEK



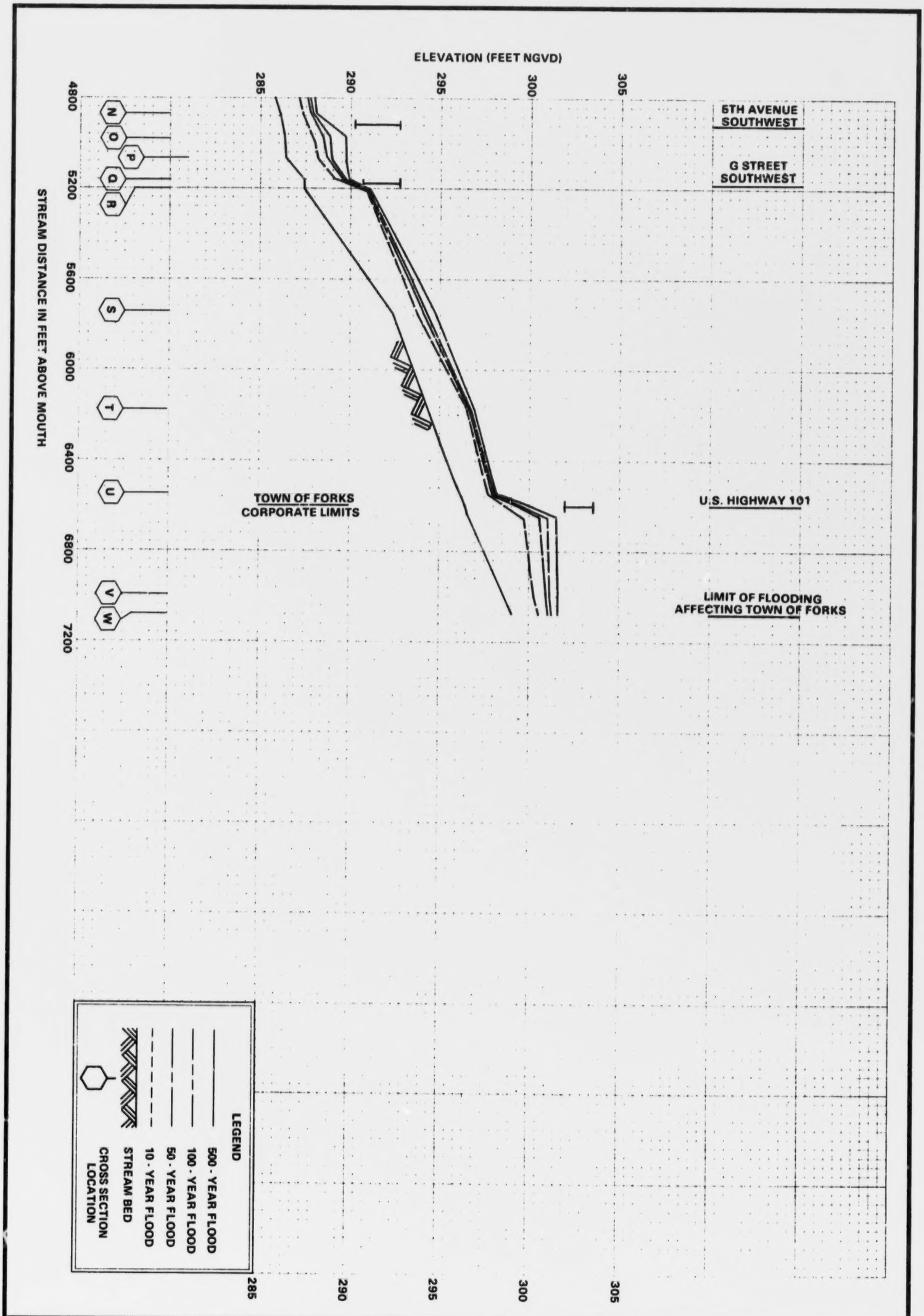
FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF FORKS, WA
(CLALLAM CO.)

FLOOD PROFILES

WARNER CREEK

03P



12

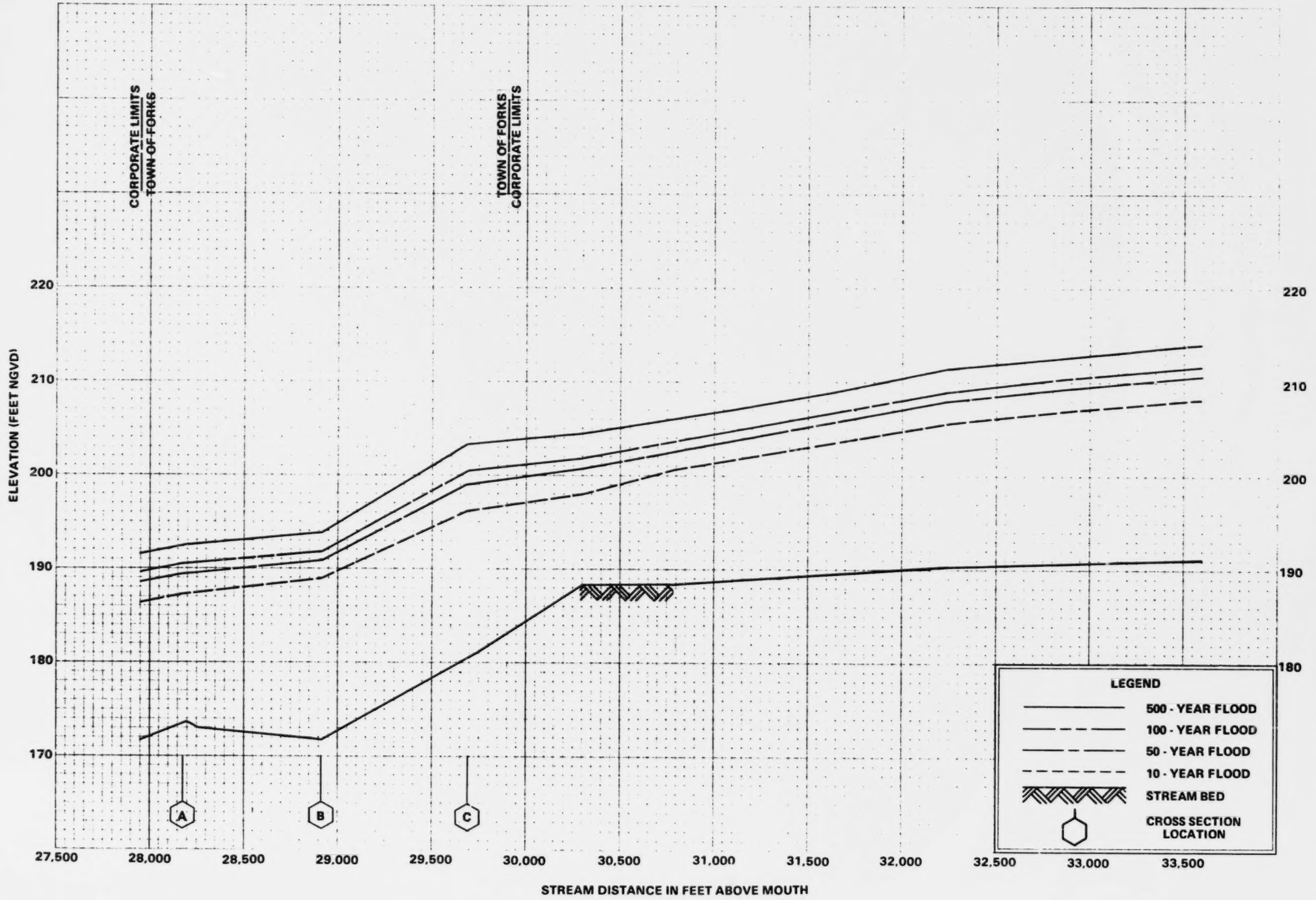
04P

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF FORKS, WA
(CLALLAM CO.)

FLOOD PROFILES

WARNER CREEK



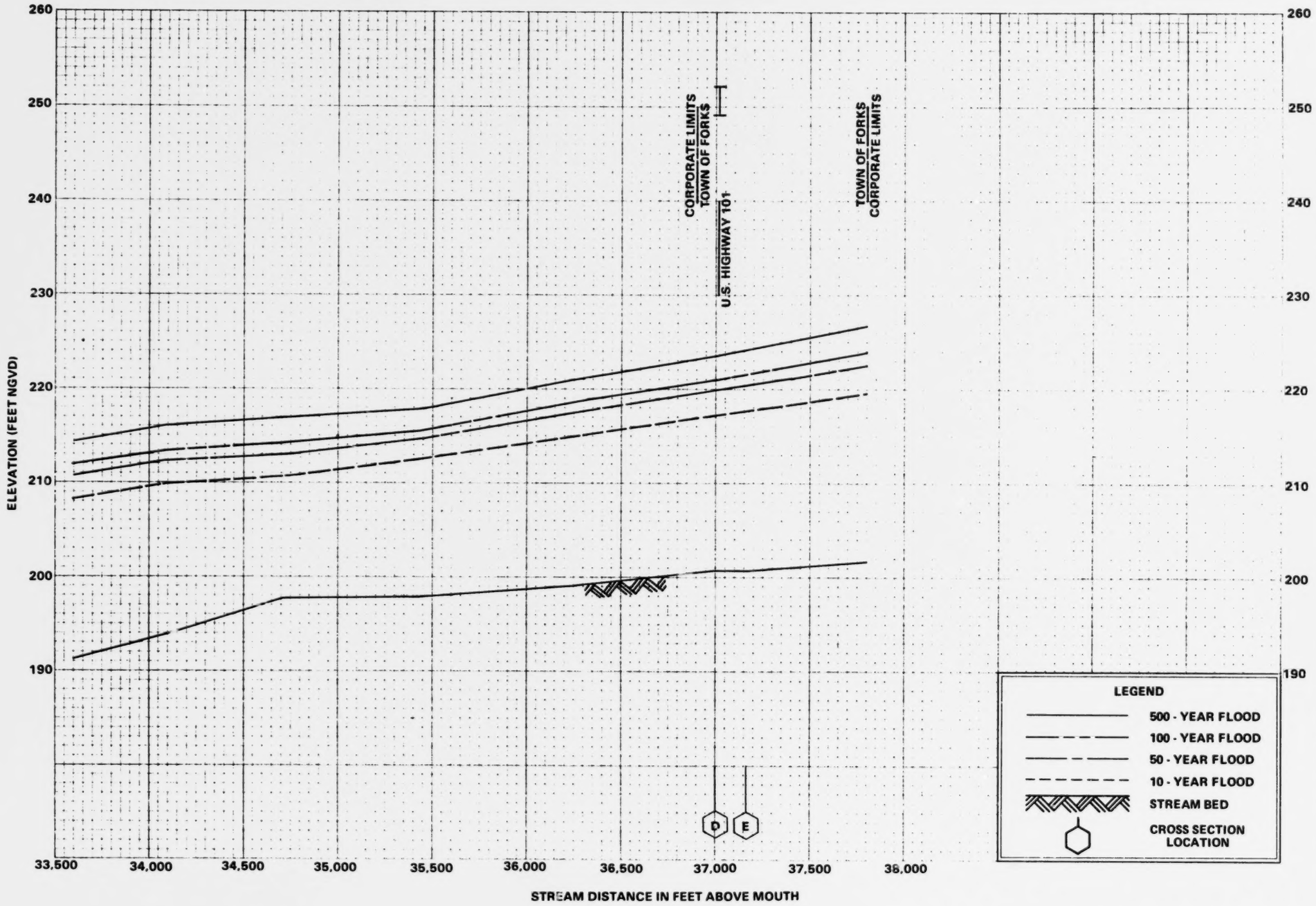
FLOOD PROFILES

CALAWAH RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF FORKS, WA
(CLALLAM CO.)

05P



FLOOD PROFILES

CALAWAH RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF FORKS, WA
(CLALLAM CO.)

06P

Exhibit 3 - Elevation Reference Marks

REFERENCE MARK	ELEVATION (FT.NGVD)	DESCRIPTION OF LOCATION
RM1*	353.02	A spike in a power pole located at the southwest corner of the intersection of Calawah Way and a road leading south located approximately 2,800 feet east of southwest corner of Forks Cemetery on Calawah Way.
RM2*	348.26	A spike in a power pole on the south side of East Division Street approximately 50 feet west of a driveway leading south to a large house approximately 4,800 feet east of the U.S. Highway 101 and Division Street intersection.
RM3	314.29	A spike in power pole no. 1 located at the northeast corner of the 6th Avenue N.E. and C Street N.E. intersection.
RM4	306.62	A spike in power pole with light located on the south side of A Street S.E.; the power pole is on the southeast corner of the 3rd Avenue S.E. and A Street S.E. intersection.
RM5	304.92	A disk at the junction of Forks Avenue N. and B Street N.W. 30.0 feet west of the center line of Forks Avenue, 34 feet north of the center line of B Street N.W., 1.5 feet north of a power line pole with a street light.
RM6	299.49	A spike in a power pole located at the northwest corner of the intersection of 3rd Avenue N.W. and B Street N.W.
RM7	304.05	A disk at the junction of First Avenue S.E., and C Street S.E., at the main west entrance to Quillayute High School, set vertically in the west face of concrete foundation.
RM8	297.87	A spike in a power pole at the northeast corner of the intersection of 2nd Avenue S.W. and C Street S.W.

Exhibit 3 - Elevation Reference Marks (cont'd)

REFERENCE MARK	ELEVATION (FT.NGVD)	DESCRIPTION OF LOCATION
RM9	301.76	A disk approximately 0.65 mile south along U.S. Highway 101 from its junction with Division Street, at the driveway entrance leading west to a supermarket, 69.0 feet east of the northeast corner of concrete foundation for a large supermarket sign.
RM10	285.59	A disk at the entrance to Forks Airport 20.5 feet northwest of the center line of entrance road to the airport, 29 feet south of a power line pole supporting two electric meters.
RM11	284.68	A spike in a power pole located at southwest corner of the intersection of 7th Avenue S.W. and G Street S.W.
RM12*	269.03	A spike in the power pole located on the northwest side of Bogachiel Way approximately 500 feet east of Page Road and approximately 100 feet east of mailbox no. RT. 3 Box 3798, Davision.
RM13	268.96	The top of the upstream right culvert at the outer end, at the Mill Creek Road crossing.
RM14	304.37	At the U.S. Highway 101 crossing of Mill Creek, the top nut in the first guard rail support post from the right on the downstream side of the road.
RM15	288.79	At the 5 Avenue S.W. crossing of Warner Creek, the top outer end of the upstream left culvert.
RM16*	300.51	At the U.S. Highway 101 crossing of Warner Creek the top upstream end of the culvert.
RM17*	317.88	At the Peterson Road crossing of Ford Creek, the top upstream end of the left culvert.
RM18*	333.34	At the East Division Street crossing of Ford Creek, the top upstream end of the left culvert.

Exhibit 3 - Elevation Reference Marks (cont'd)

REFERENCE MARK	ELEVATION (FT.NGVD)	DESCRIPTION OF LOCATION
RM19	258.39	A disk approximately 0.75 mile north along U.S. Highway 101 from intersection of U.S. Highway 101, East Division Street in the Town of Forks, at the Highway bridge across the Calawah River, 28 feet northwest of the southeast end of the northeast concrete guardrail established by U.S. Coast and Geodetic Survey.

*Outside Corporate Limits